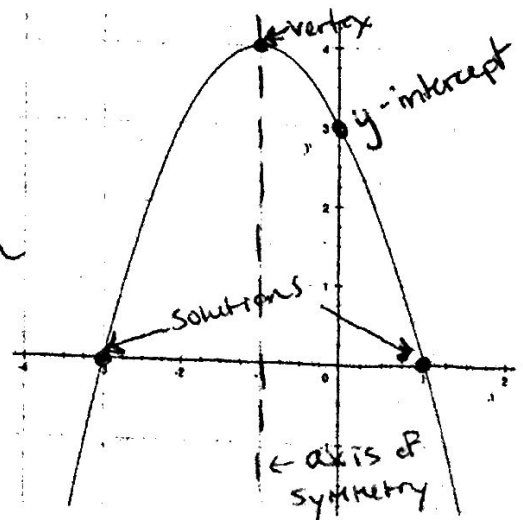


REVIEW - QUADRATIC FUNCTIONS

KEY

BASIC CONCEPT QUESTIONS

- Name and write the equation of the two forms we use to represent quadratic functions.
Standard Form: $y = ax^2 + bx + c$ Vertex Form: $y = a(x-h)^2 + k$
- Circle all of the following functions that are quadratic functions.
 $y = -\frac{1}{2}x + 3$ $y = 8x^2 - 7$ $y = x^2$ $y = 9x^3 - 5x^2 + 2$ $y = -6(x+1)^2$
- Given an equation, how do you know if a parabola is concave up or concave down?
If a is positive \rightarrow Concave up a negative \rightarrow Concave down
- Given an equation, how do you know if the parabola will be skinnier or wider than the parent function?
 $|a| > 1 \rightarrow$ skinnier $|a| < 1 \rightarrow$ wider $* \text{negatives don't matter!}$
Use absolute value!
- What do c and k change about the graph?
Shift up + down (vertical translation)
- What does the h value change about the graph?
Shift left and right (horizontal translation) $* \text{opposite sign as what you see in } ()$ left + right -
- What is the vertex?
Max or min value, turning point. Always on axis of symmetry.
- How do you find the vertex of a quadratic function?
a. From Standard Form? $x = -\frac{b}{2a}$ plug back in (h, k)
b. From Vertex Form?
- From the equation, how can you tell if the vertex will be a maximum or a minimum?
 $a > 0 \rightarrow$ min $a < 0 \rightarrow$ max
- What is the axis of symmetry? $x =$
Line through vertex down middle of parabola (that cuts it into 2 symmetric halves)
- How do you find the axis of symmetry? $-x$ value of vertex
a. From Standard Form? $x = -\frac{b}{2a}$
b. From Vertex Form? $x = h$
- How do you find the y-intercept of any function?
plug in $x = 0$
- List all the other names for "solutions" of a quadratic function.
roots, zeros, x-intercepts
- What do you need to be sure is true about your function before you start finding solutions?
that it $= 0$
- What are the 3 methods for finding solutions of a quadratic function?
① Graphing (+ find x-intercepts) ② Factoring + zero product property ③ Quadratic Formula
- State the quadratic formula.
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- What is the discriminant? $b^2 - 4ac$
- What does the value of the discriminant tell you about your function if it is
a. positive \checkmark 2 real solutions
b. negative \times 2 complex solutions
c. zero \checkmark 1 real solution
- Label all of the key features (vertex, axis of symmetry, solutions, y-intercept) on the graph to the right.
- Give either definition for i .
 $i = \sqrt{-1}$ $i^2 = -1$



PRACTICE PROBLEMS

21. Simplify $(3+7i) - (9+4i) = -6+3i$

22. Simplify $(3+7i)(9+4i) = 27+12i+63i+28i^2 = 27+75i-28 = -1+75i$

23. Simplify $\sqrt{-36} = 6i$

24. If $f(x) = x^2$, find and simplify $f(3i)$.

$f(3i) = (3i)^2 = 9i^2 = 9(-1) = -9$

25. Solve $\sqrt{x^2} = \sqrt{81}$. (Make sure you find BOTH solutions, not just one)

$x = \pm\sqrt{-81} = \pm 9i$

26. What is the value of x in the equation $(\sqrt{x+4})^2 = (2i)^2$?

$x+4 = 4i^2$
 $x+4 = -4$

$x = -8$

27. What is the greatest common factor of $24a^3b^2c$ and $10ab^2c^3$?

$2ab^2c$

28. If $5x$ is one factor of $10x^2 - 15x$, what is the other factor?

$5x(2x-3)$

$2x-3$

29. Factor $x^2 - 81$.

$(x-9)(x+9)$

30. Factor $3x^2 - 12$ completely.

$3(x^2 - 4) = 3(x-2)(x+2)$

31. What is a common factor of $x^2 + 3x - 10$ and $x^2 + 6x + 5$?

$(x+5)(x-2)$

$(x+5)(x+1)$

$x+5$

32. Consider the function $y = 4x^2 - 24x - 7$

a. Find the y-intercept $(0, -7)$

b. Will the vertex be a maximum or a minimum? Why? Min because a is positive

c. Find the vertex. $x = \frac{-(-24)}{2(4)} = \frac{24}{8} = 3$ $4(3)^2 - 24(3) - 7 = -43$ $(3, -43)$

33. Sketch the graph of a quadratic function that has

a. exactly one positive solution

b. exactly two solutions, one positive and one negative

c. no real solutions



34. Find the solutions of $6x^2 = 150$

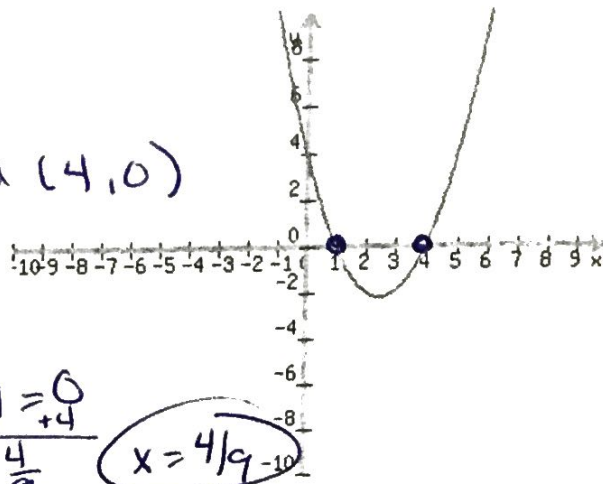
$\frac{6x^2}{6} = \frac{150}{6}$
 $x^2 = 25$

$x = \pm 5$

35. State the solution(s) of the quadratic function based on the graph to the right.

$$x = 1, 4$$

$$\text{or } (1, 0) \text{ and } (4, 0)$$



36. Find the solutions of $9x^2 = 4x$ by factoring. SHOW ALL WORK.

$$9x^2 - 4x = 0$$

$$x(9x - 4) = 0$$

$$x = 0$$

$$\text{or } 9x - 4 = 0$$

$$\frac{9x}{9} = \frac{4}{9}$$

$$x = \frac{4}{9}$$

$$x = \frac{4}{9}$$

37. Find the solutions of $y = x^2 - 6x - 7$ by factoring. SHOW ALL WORK.

$$(x - 7)(x + 1) = 0$$

$$x - 7 = 0$$

$$\frac{x - 7}{+7 \quad +7}$$

$$x = 7$$

$$x + 1 = 0$$

$$\frac{x + 1}{-1 \quad -1}$$

$$x = -1$$

38. Find the solutions of $y = -2x^2 + 6x + 5$ using the quadratic formula. SHOW WORK.

$$a = -2 \quad b = 6 \quad c = 5$$

$$b^2 - 4ac = 6^2 - 4(-2)(5) = 76$$

2 real solutions

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-6 \pm \sqrt{76}}{-4}$$

$$\rightarrow \approx 3.68$$

$$\rightarrow \approx -0.68$$

39. Find the solutions of $f(x) = 3x^2 + 2x + 7$ using the quadratic formula. SHOW WORK.

$$a = 3 \quad b = 2 \quad c = 7$$

$$b^2 - 4ac = 2^2 - 4(3)(7) = -86$$

2 Complex solutions

$$x = \frac{-2 \pm \sqrt{-86}}{6} = \frac{-2 \pm i\sqrt{86}}{6}$$

40. Find the solutions of $x^2 + 7x = -10$ using the method of your choice. SHOW WORK.

$$x^2 + 7x + 10 = 0$$

$$(x + 5)(x + 2) = 0$$

$$x + 5 = 0$$

$$\frac{x + 5}{-5 \quad -5}$$

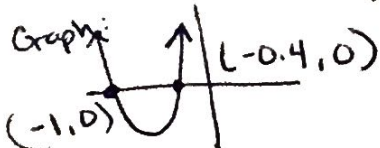
$$x = -5$$

$$x + 2 = 0$$

$$\frac{x + 2}{-2 \quad -2}$$

$$x = -2$$

41. Find the solutions of $y = 5x^2 + 7x + 2$ using the method of your choice. SHOW ALL WORK.



$$x = \frac{-7 \pm \sqrt{9}}{10} = \frac{-7 \pm 3}{10}$$

$$\rightarrow -0.4$$

$$\rightarrow -1$$

$$\text{Factoring}$$

$$(5x + 2)(x + 1) = 0$$

$$5x + 2 = 0$$

$$5x = -2$$

$$x = -\frac{2}{5}$$

$$x + 1 = 0$$

$$\frac{x + 1}{-1 \quad -1}$$

$$x = -1$$

42. Write the equation of a quadratic function that is concave up, skinnier than the parent function, and whose vertex is at (2, 12)

$$y = \frac{1}{4}(x - 2)^2 + 12$$

any # bigger than 1

$$\text{Ex: } y = 3(x - 2)^2 + 12$$

43. Write the equation of a quadratic function that is concave down, wider than the parent function and is shifted down 5 units.

$$y = -\frac{1}{2}x^2 - 5$$

any # whose absolute value is < 1

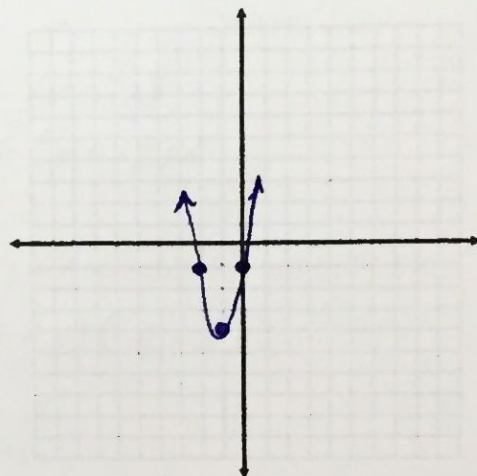
Ex: $y = -\frac{1}{2}x^2 - 5$

44. Consider the function $f(x) = 2(x-5)^2 + 3$. Write the equation of a new function, $g(x)$, that takes $f(x)$ and shifts it 4 units left and 9 units down.

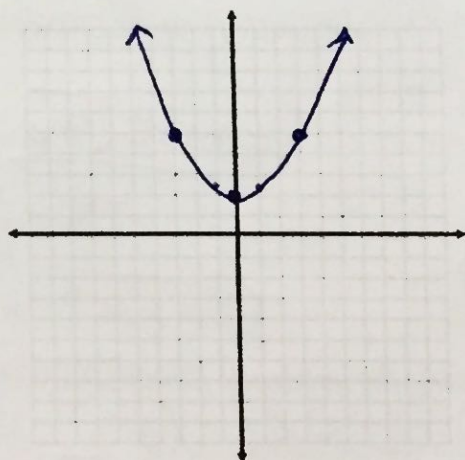
$$g(x) = 2(x-1)^2 - 6$$

45. Graph the function $y = 3(x+1)^2 - 4$.

vertex $(-1, -4)$ $a=3$



46. Graph the function $y = \frac{1}{3}x^2 + 2$. vertex $(0, 2)$ $a = \frac{1}{3}$



47. An object in the air is given by the equation $h(t) = -16t^2 + 56t + 300$.

d. Find the time when the object reaches its maximum height.

e. Find the maximum height of the object.

f. How high is the object after 1.2 seconds in the air?

Find on calc or use $x = -\frac{b}{2a}$

vertex: $t = 1.75 \text{ sec}$

$h = 349 \text{ ft}$

plug in for t

$$-16(1.2)^2 + 56(1.2) + 300 = 344.16 \text{ ft}$$

48. Given the table, find the equation of the quadratic function.

$$y = 1(x-3)^2 + 0$$

$$\text{or } y = (x-3)^2$$

| x | y |
|---|---|
| 1 | 4 |
| 2 | 1 |
| 3 | 0 |
| 4 | 1 |
| 5 | 4 |

vertex $(3, 0)$ $a=1$